國立臺北科技大學 105 學年度碩士班招生考試

系所組別：2210 電子工程系碩士班甲組

第二節　計算機概論　試題

注意事項：

1. 本試題共 7 題，共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一、Selection Questions:

1. [3%] For a table of n records, which of the following search methods' time complexity can be $O(1)$ in the average-case?
   (A) Sequential (B) Binary (C) Hashing (D) None of the above.

2. [3%] What kind of sorting algorithm can sort n size data in $O(n \lg n)$ worst case time while having the in-place property?
   (A) Insertion Sort (B) Heap Sort (C) Merge Sort (D) Quick Sort.

3. [3%] In the operating system, which of the following instructions does not have to be allowed in kernel mode?
   (A) Disable all interrupts (B) Read the time of day clock (C) Set the time of day clock (D) Change the memory map.

4. [3%] Which of the following programs is not an OS component?
   (A) Command Interpreter (B) CPU Scheduler (C) File Manager (D) Memory Manager.

5. [3%] What is the purpose of virtual memory?
   (A) Enlarge the main memory address space (B) Speed up main memory access
   (C) Enlarge the external storage address space (D) Speed up the external storage access.

6. [3%] In CPU, which of the following register holds address of the next instruction to be fetched from memory?
   (A) Program Counter (B) Instruction Register (C) Status Register (D) Accumulator.

7. [3%] Which of the following mobile OS is open-source software?
   (A) iOS (B) BlackBerry 10 (C) Android (D) Windows Phone.

8. [3%] Which of the following CPU characteristics does not belong to the RISC architecture?
   (A) Have a lower number of instructions (B) Have a much more efficient instruction pipeline (C) Have a lower number of registers (D) Instruction formats are of fixed length.

9. [3%] What program is run first when the microprocessor is powered ON?
   (A) Bootloader (B) Operating System (C) Device Driver (D) Hyperterminal.

10. [3%] What kind of medium access control technique is adopted by the IEEE 802.11 protocol for wireless local area networks?
    (A) CSMA (B) CSMA/CD (C) CSMA/CA (D) ALOHA.

11. [3%] Which of the following wireless technology is based on the IEEE 802.15.4 standard?
    (A) Bluetooth (B) ZigBee (C) WiFi (D) WiMAX.

12. [3%] In the TCP/IP protocol stack, the IP layer provides an
    (A) Connection-oriented, reliable (B) Connection-oriented, unreliable (C) Connectionless, reliable (D) Connectionless, unreliable communications.

13. [3%] Which layer does the UDP communication protocol belong to?
    (A) Application (B) Data link (C) Network (D) Transport.

14. [3%] Which of the following address is a 48-bit number burned into ROM on the device that should provide a globally unique identifier?
    (A) IP address (B) MAC address (C) Port address (D) Socket address.

15. [3%] Which of the following device can select one of several analog or digital input signals and forwards the selected input into a single line?
    (A) Multiplexer (B) Decoder (C) A/D Converter (D) D/A Converter.

二、Short answer questions: Briefly answer the following terminologies.

1. [5%] Embedded system.
2. [5%] Critical section (OS problem).
3. [5%] Binary search.

注意：背面尚有試題

三、[5%] Subtract $(110)_{10}$ from $(117)_{10}$ using 2'complement arithmetic and determine the magnitude of the result in binary form.

四、[5%] Suppose we want to transmit the message 11001001 and protect it from errors using CRC polynomial x^3+1. What message should we transmit?

五、[10%] For the equation: $S_n = 2 + 4 + 6 + \ldots + 2n$

1. Write the recurrence relation for S_n.
2. Design a recursive algorithm to solve the above equation and represent its time complexity using asymptotic notation.

六、[10%] What is the interrupt driven I/O? Explain its advantages.

七、[10%] What is the output when the following C program is run?

```
#include "stdafx.h"
void test ( int m, int *n, int &a, int *b );
int m = 11;
int n = 22;
int a = 33;
int b[ ] = {44 , 55 , 66 , 77 , 88};

int main ()
{
    printf ("1: m = %d, n = %d, a = %d, b = %d \n\n", m, n, a, *b );
    test ( m , &n , a , b+1 );
    printf ("3: m = %d, n = %d, a = %d, b = %d \n", m, n, a, *(b+1) );
    return 0;
}

void test ( int m, int *n, int &a, int *b )
{
    m = m + 1;
    *n = *n + 1;
    a = a + 1;
    *b = *b + 1 ;
    printf ("2: m = %d, n = %d, a = %d, b = %d \n\n", m, *n, a, *b );
}
```